

PATENT SPECIFICATION

1,044,541



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COMPLETE SPECIFICATION

DRAWINGS ATTACHED.

Improvements in or relating to Weigh-feed Mechanisms

We, CLIFFE & COMPANY LIMITED of Longroyd Bridge, Huddersfield, in the County of York, a British Company, do hereby declare the invention, for which we 5 pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The object of this invention is to provide 10 a weigh-feed mechanism of general application, but more specially, the invention has been developed with the needs of a textile weigh-feed mechanism in mind. It is well known that the greatest single factor affecting 15 the levelness and weight of the sliver or slubbing produced on a textile carding machine is the degree of accuracy of the weigh-feed mechanism with its weigh-pan arrangement. By means of the present invention, the performance of such a weigh- 20 feed mechanism is improved.

According to this invention, an arrangement for delivering weighed material to a processing machine comprises a weigh-feed 25 mechanism comprising a conveyor adapted to supply the material to be weighed to a weigh-pan, the weigh-pan being adapted to stop the conveyor when the pan receives a predetermined weight of material, and a control 30 mechanism comprising three control devices adapted to be actuated successively by a timing mechanism driven in timed relationship with the processing machine these control devices being arranged to cooperate in such a way with a fourth control device, adapted to be actuated by the weigh-pan as 35 to regulate a variable speed drive to the conveyor, so that if the weigh-pan weighs early (i.e., before the appropriate period in the 40 cycle of the timing mechanism to give a correct feed of material to the processing machine) the speed of the conveyor is reduced; if the weigh-pan weighs correctly

there is no change of the speed of the conveyor, and if the weigh-pan weighs late, the 45 speed of the conveyor is increased.

In a preferred arrangement, there is a fifth control device adapted to be operated if the weigh pan weighs early or correctly, to prevent any alteration in the speed of the conveyor due to subsequent operation of the control device associated with late weighing.

The control devices may be mechanical devices—such as valves for a hydraulic or pneumatic system, or clutches for a purely 50 mechanical drive—or they may be electrical switches controlling solenoids.

In the preferred arrangement hereinafter described, as applied to a weigh-feed mechanism for a textile carding machine, it has been found desirable to control the variable speed drive through pneumatic cylinders operating the adjusting device of a variable speed unit of the kind which is capable of providing an infinite number of ratios over 55 a specific range of operation. Pneumatic cylinders are less prone to defects due to the presence of fibres than solenoids, and of course, there is less fire risk. It has also been found practicable to operate certain 60 associated parts of the weigh-feed mechanism by pneumatic means. For example, the weigh pan may be provided with doors opened and shut by pneumatic cylinders, and there may be a pushing-up board 65 adapted to push fibres delivered on to the feed-sheet of the scribbling or carding machine forwardly towards the likerin roller, this pushing-up board being also pneumatically driven.

It is preferred that the timing mechanism should take the form of a series of cams mounted on a common shaft. This is a simple arrangement which is easy to drive (and the shaft may be the output shaft of a 85 variable speed unit) and the cams can be

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adapted to operate valves or switches as required.

One arrangement of a weigh-feed mechanism and its control mechanism in accordance with the invention for a textile carding machine, will now be described by way of example only, with reference to the accompanying drawings in which:—

Figure 1 is a side view of a weigh-feed mechanism, with the near side wall removed to show its driving arrangements,

Figure 2 is a view of the other side of the weigh-feed mechanism shown in Figure 1.

Figure 3 is a sectional plan view of the mechanism shown in Figures 1 and 2, taken on the line III-III in Figure 1.

Figure 4 is a part sectional view to a larger scale of a variable speed reduction unit.

Figure 5 is a part sectional elevation of a control box and cam mechanism.

Figure 6 is a plan view of the control box shown in Figure 5 with the lid removed.

Figure 7 is an end view of the mechanism shown in Figure 5 looking in the direction of arrow VII, and

Figure 8 is a schematic diagram of a pneumatic circuit.

Referring to Figures 1, 2 and 3, there is illustrated a weigh-feed mechanism for a textile carding machine. A hopper 10 has an endless travelling conveyor 11 arranged horizontally in the hopper, and this conveyor is driven by gearing 12 and a chain drive 13 from a pulley 14 mounted on the output shaft of a speed reduction gearbox 15 (the drive to which will be described later). The conveyor 11 forms the floor of the hopper 10, and carries fibrous material placed in the hopper towards a travelling sheet or spiked elevator 16 arranged at the outlet end of the hopper. The spiked elevator 16 is passed around top and bottom rollers 17 and 18 and a tensioning roller 19. Fixed on the shaft of the top roller 17 is a pulley 20, and there is a chain drive 21 from a pulley 22 fast on a layshaft 23. Also fast on the layshaft 23 is a driven pulley 24, which is driven by a belt 25 from a second pulley 26 on the output shaft of the speed reduction gearbox 15. Thus both the horizontal conveyor 11 and the spiked elevator 16 are driven from the output side of the gearbox 15, and it is these two conveyors which cause the delivery of the material out of the hopper 10.

A main driving motor 27 is mounted on a part of the hopper framework (indicated at 28 in Figure 3) below the spiked elevator 16, and its output shaft is connected via a flexible coupling 29 with a variable speed unit 30 of the type usually referred to as infinitely variable. That is to say, the unit 30 is capable of an infinite number of speed ratios between predetermined limits and

there are control means (which will be described in detail later) whereby the effective ratio of the variable speed unit 30 can be varied. On the output side of the variable speed unit, there is a driving connection 70 through a combined clutch brake and coupling unit 31, with the input side of the reduction gearbox 15.

A separate electric motor 32 is fixed on one side wall of the hopper 10, and a pulley 33 fixed on the output shaft of this motor drives a belt 34, which drives a pulley 35. The pulley 35 is connected to an eccentric motion 36 which carries a comb 37, and there is a pivoted lever 38 and a link 39 which together restrict the motion of the comb 37 to an oscillating motion. The comb 37 is used to comb off the ascending stretch of the elevator 16, any excessively large lumps of fibrous material, and it does not matter if this comb continues to oscillate when the elevator 16 is stopped.

A further pulley 40 fixed on the layshaft 23 drives a belt 41 which in turn drives a pulley 42 fixed on one end of a rotating brush or comb 43. The rotating brush thus only operates when the elevator 16 is working, and is used to brush fibrous material off the upper part of the descending stretch of that elevator.

Below the brush 43, there is an open topped scale pan 44 which extends across the full width of the mechanism to receive all the material which drops or is brushed off the elevator 16. The scale pan is supported by pivoted levers 45 and 46 one at each side of the mechanism, and is balanced by a balance weight device 47 which is movable along the lever 46. Balanced scale pans are well known in textile hopper-feed mechanisms, but in this instance the balance weight device is constructed as described in Patent Application No. 9676/63 (Serial No. 990,894). As in the conventional weigh-feed mechanism, the scale pan is arranged so that when it has received a predetermined weight of material, it drops and in so doing, it operates a control mechanism which stops the elevator 16, and the brush 43, so that no more material is fed to the pan. This mechanism controls the quantity of material delivered from the hopper to the pan.

The scale pan has to deliver its load of fibrous material to a horizontal travelling sheet conveyor 48, which forms part of a scribbler and which feeds materials to the feed rollers 49 and like-in 50 of the scribbler. (The remainder of the scribbler and the card are not shown). To ensure uniform output and levelness of the slubbing produced on the card, the scale pan must weigh accurately, and it must deliver its loads to the conveyor 48 at correctly timed intervals. The timing of the delivery does not present great difficulties, and in conventional mecha-

- nical arrangements, it is achieved by a gear segment rotated in timed relationship with the motion of the conveyor 48, which segment meshes with a gear pinion on the scale pan, and upturns the pan so that its contents fall out on to the conveyor 48. But the problem of ensuring accurate weighing is acute, because of the nature of the material and the method of feeding it from the hopper 10 into the pan.
- If the material is being delivered at too quick a rate from the hopper, the pan will "weigh" (i.e. it will lower) early in the cycle of the segment, and there will be a comparatively long delay before the pan is turned over. This early weighing is usually associated with underweight loads, because the material has been delivered so quickly that its kinetic energy has caused the pan to drop before the correct weight had been delivered. Conversely if the pan weighs late, it only just drops before it is overturned. If the mechanism persistently weighs late, then eventually it may fail to weigh at all in one cycle (because it does not drop until the segment has passed) and consequently there is a blank space on the conveyor 48. The invention provides a method of correcting automatically for early or late weighing.
- In this arrangement, there is no rotating segment, and the scale pan is not overturned. Instead, the scale pan has a pair of door flaps 51 and 52, each of which is hinged so that it can swing from the closed position shown in Figures 1 and 2, to an open position as indicated by dotted lines in Figures 1 and 2. A link 53 is connected between each flap 51 and 52 and a cross piece 54, and this cross piece is fixed to the lower end 40 of the ram of a double acting pneumatic cylinder 55. There are two pneumatic cylinders 55 arranged one at each side of the machine. Thus if air under pressure is admitted to the upper ends of the cylinders 55, the rams will descend, and so will the cross pieces 54, so that the links 53 force their respective doors to swing open. Of course, the opening of the doors 51 and 52 has exactly the same effect as the overturning of a scale pan. To close the pan doors, it is only necessary to admit air under pressure to the lower ends of the cylinders 55.
- At the opposite end of the lever 46 to the scale pan, there is a pneumatic servo valve 56, which is adapted to be operated each time that part of the lever 46 rises (i.e. when the scale pan drops or "weighs"), a pneumatic control valve 57 adapted to be operated by the servo valve 56, and a micro-switch 58 also adapted to be operated by the servo valve 56, when the scale pan weighs. The micro switch is connected in an electrical circuit (not shown) which controls the clutch and brake 31. This circuit is so arranged that so long as the scale pan remains in its upper position, the clutch is engaged, the brake is released, and so drive is maintained to the elevator 16 and brush 43; but as soon as the scale pan weighs, the clutch is disengaged and the brake applied, so that the elevator 16 and brush 43 are arrested very quickly. It will be appreciated that the scale pan need only move a small distance to operate the servo valve and the micro switch, and the use of electrical control of the clutch and brake provides a very quick response to a signal from the scale pan that the correct weight of material has been received.
- A double acting pneumatic cylinder 59 is fixed on one side of the hopper, with its ram pointing down towards the end of the lever 46 to which the pan is attached. This double acting cylinder 59 is only provided to cushion the return of the pan after it has discharged its load, because if the pan is not cushioned, it might bounce down again from the top position sufficiently to operate the switch 58 which would stop the feed elevator 16. The arrangement is such that the ram of the cushioning cylinder is projected (as will be further described) when the pan 44 drops, and then the returning lever 46 engages the ram, and has to ride back into its original position in engagement with the retractive ram, which thus provides the cushioning effect.
- It has been found advantageous to provide a device for pushing material delivered on to the conveyor 48 forwards towards the likerin 50 after each delivery from the weigh pan 44. This device takes the form of a pushing-up board 60, which is simply a vertical board extending across and just above the top flight of the conveyor 48, this board being carried by blocks 61 which slide in guides 62 at each side of the hopper, so that the board has a rectilinear forwards and backwards motion. A pair of pneumatic cylinders 63 and 64 are provided, one at each side of the hopper, to provide the motive force for the pushing-up board. The control of these cylinders will be described later.
- The apparatus so far described provides means for weighing the material delivered to the scale pan, stopping the feed of that material, allowing it to fall from the scale pan, and pushing it towards the likerin. It does not however deal with the problem of timing the opening of the scale pan, and making adjustments to correct early and late weighing. These problems are dealt with by apparatus which will now be described.
- Fixed on the frame below the scale pan is a variable speed unit 100, having an input shaft 104 driven by a chain drive 102 from the delivery rollers 49 of the scribbler. Therefore, the unit 100 is driven in timed relationship with the scribbler. An output shaft 106 on the unit 100 is used to drive a

- series of cams as will be further described.
- Referring now to Figures 5, 6 and 7, the unit 100 is housed in a rectangular box 108, traversed by the input and output shafts, mounted with their axes parallel, in suitable journal bearings 110. A metal disc 112 is fixed on the input shaft 104, and a similar disc 114 is fixed on the output shaft 106. These discs are of such a size that they have a considerable area of overlap. That is to say, each disc approaches quite near to the shaft on which the other disc is mounted and there is a lozenge shaped area of overlap as is shown in Figure 5.
- 15 A ball thrust bearing 116 is arranged on each shaft 104 and 106, between the disc on that shaft and the side of the box, the two bearings being on opposite sides of their respective discs, so as to be adapted to resist 20 thrust tending to separate the discs. A compression spring 118 extends between the disc 114 and its bearing 116. The inner faces of the discs are covered with a rubber lining 120.
- 25 An adjusting rod 122 is mounted for rotation in bearings 124 and 126 in the box 108, and this rod extends longitudinally of the box (i.e. at right angles to the input and output shafts) above the two shafts 104 and 106 (see Figures 5 and 6). At one end the rod 122 projects outside the box, and is fitted with a hand-wheel 125. The middle portion 126 of the rod is screw-threaded, and a carrier block 128 is screwed internally to fit on 30 this screw-threaded portion. Collars 130 and 132 are also fitted on the screw-threaded portion of the rod, but these are screwed to the ends of the screwed portion, where they act as stops for the axial movement of the 35 carrier block 128.
- 40 At its lower end, the carrier block is bifurcated and a roller 134 is mounted for rotation on a shaft 136 fixed across the bifurcated portion. The axis of this roller 134 is 45 parallel with the axis of the adjusting rod 122, and in the plane which contains the axes of the two shafts 104 and 106. The periphery of the roller is barreled or convex, and is preferably covered with rubber or 50 plastics friction material. In fact the whole roller 134 may be made of such material. The stops 130 and 132 on the rod prevent the carrier block taking the roller out of the 55 area of overlap of the discs 112 and 114 so that its periphery always engages with both discs.
- When the input shaft 104 rotates, the roller 134 is driven by frictional engagement of its periphery with the side of the disc 112.
- 60 The roller in turn drives the output shaft 106 by frictional engagement with the other disc 114. If the hand-wheel 125 is turned, the adjusting rod 122 is also turned, and the carrier block 128 moves to adjust the positions of engagement of the roller 134 with

the two discs 112 and 114. When the roller 134 is near to the axis of the input shaft, there is a reduction in speed from input to output shaft, and when it is near to the axis of the output shaft there is an increase in speed from input to output shaft. The actual ratio can be varied by turning the hand-wheel.

As illustrated in Figure 7, brackets 136 and 138 are fixed on opposite sides of the box 108, and there are five lower operated pneumatic valves 140, 142, 144, 146 and 148 fixed on these brackets two on one side of the box and three on the other. The output shaft 106 extends on both sides of the box, and five cams 150, 152, 154, 156 and 158 are fixed on these extensions, each cam co-operating with a corresponding lever 162 to operate the valves 140, 142, 144, 146 and 148. For this purpose each valve lever has a roller 164 at its lower end, which acts as a cam follower by rolling on the periphery of its corresponding cam.

The purpose of the cam operated valves will appear later, but it will be noted that they are all operated once per complete rotation of the shaft 106, i.e. once in each cycle, that the cycle time is directly related to the speed of the scribbler, but that the cycle time is capable of being varied and pre-set manually.

Referring now to Figure 4 of the drawings, the variable speed unit 30 is of the type in which the effective ratio can be varied by rotation of a shaft 170 which projects horizontally through the side of the unit, into a housing 171 fixed on the unit.

Fixed on the shaft 170 is a toothed wheel 172 (only some of the teeth are shown in Figure 4) so that the shaft 170 can be rotated to adjust the speed ratio of the unit by turning the wheel 172. A pair of pneumatic cylinders 173 and 174 are fixed on the housing 171, facing each other, and each carries on its ram a pawl 175 which engages with the teeth of the wheel 172. The pawls 175 are pivoted and spring loaded into the positions shown, so that if either ram is projected (by air pressure applied to the cylinder) the pawl will push the wheel 172, but on its return stroke, the pawl rocks on its pivot against its spring loading, to allow the pawl to slide back over the teeth of the wheel 172. When the ram is fully retracted, the pawl is out of engagement with the teeth of the wheel 172.

A spring loaded ball 176 is provided in the housing 171, for engagement with the teeth of the wheel 172 to help to retain the wheel in any position to which it is moved by operation of the cylinders 173 and 174. This ball will hold the wheel during any period when the machine is inoperative. During operation however, the spring loaded ball may not be an adequate stop, and the wheel might spin when forced round by one

- of the pneumatic cylinders. To prevent this, there is a pneumatic stop cylinder 177 fixed on the housing 171. Within the cylinder 177, there is a piston 178 carrying a plunger 179 which is engageable with the teeth of the wheel 172. The piston 178 is loaded by a compression spring 180 to the position shown, where the plunger locks the wheel 172 and there is a cap 181 screwed on to the outer end of the cylinder 177, to provide means for adjusting the pressure of the spring 180. An air inlet hole 182 is provided on the inside of the piston 178, so that air admitted to the cylinder forces the piston 179 outwards to release the wheel.
- At two positions around the periphery of the wheel, two teeth are cut away (as shown at 183) to provide limits for the movement of the wheel under the influence of the pawls 175, and these limits correspond with the maximum and minimum ratios of the unit 30.
- It will now be understood that the driving mechanism provides a means of adjusting the timing of the weighing. If the mechanism weighs early, then the unit 30 is adjusted (by operation of the cylinder 173) to decrease the speed of the feed elevator 16. On the other hand if the mechanism weighs late, then the cylinder 174 must be operated to increase the speed of the elevator 16. So long as the mechanism is weighing at the correct time, then no adjustment in elevator speed is required.
- The pneumatic controls required to provide these automatic adjustments will now be described, but first reference must be made to the functions of the five cams 150, 152, 154, 156 and 158 shown in Figure 7, and their respective valves 140, 142, 144, 146 and 148 which are also shown (diagrammatically) in Figure 8. The valve 140 is referred to as the early weigh valve and its cam is set so that this valve is opened throughout that part of the cycle during which a fall of the scale pan would be an early weigh. The valve 142 is the correct weigh valve and its cam is set to open it during the part of the cycle during which a fall of the scale pan should occur for correct weighing. The valve 144 is the late weigh valve, and its cam is set to open it during the late weigh part of the cycle. The valve 146 is the scale door valve, and its cam is set to operate it immediately after the late weigh period. Finally the valve 148 is the pushing-up board valve and its cam is set to operate it immediately after the operation of the scale door valve. The cams are so arranged that there is a dwell period between the operation of the pushing-up board valve 148, and the operation of the early weigh valve 140 on the next cycle. The circle around which the valves are shown arranged in Figure 8, represents one cycle of the
- weighing mechanism or one revolution of the output shaft 106 of the unit 100.
- Mounted on one side of the hopper 10 is a pneumatic control panel 200, and this panel carries the following items of equipment:—
- (1) Three pilot operated piston valves 201, 202 and 203, fitted with flow controls and each of which is of the type wherein the input of air under pressure can be directed to either of two outlet ports under the influence of pneumatic control signals, and the exhaust can be adjusted manually to control the speed of operation of the pneumatic cylinders controlled by those valves.
 - (2) A filter 204 and a lubricator 205 for a compressed air supply (not shown).
 - (3) A second air filter 206, and
 - (4) A manifold 207 provided with a manually operable plunger 208, the purpose of which will appear later.
- The operation of the pneumatic controls will now be described.
- Air under pressure enters the control system at 209, and passes through the filter 204 and lubricator 205 direct to the manifold 207. From the manifold, air is supplied via the pipes 210, 211 and 212 to the valves 201, 202 and 203, and via the pipe 215 to a pushing up valve 216 which is arranged on the pushing up board slide, so that it will be operated at the end of the stroke of the pushing-up board 60. Some air passes through the pipe 213, the filter 206 and the pipe 214 to the servo valve 56. Also, a pipe 217 leads air from the manifold 207 to both the valves 146 and 148, and through the pipe 218 to the valve 57. This is the condition when the mechanism is started.
- Whenever the scale pan weighs, the servo valve 56 will cause operation of the valve 57, and air will pass through the valve 57 and via the pipe 219 to the pilot valve 203, and via the pipe 220 to the valves 140 and 142, and via the pipe 221 to a bulking pilot valve 222. Whether the air thus supplied to the valves 140, 142 and 222 can flow through those valves depends upon the action of the cams on the variable speed unit 100. The flow of air into the pilot valve 203, opens that valve so that air flows through it along the pipe 223 to operate the cushioning cylinder 59, and project the ram of that cylinder.
- Supposing that the pan weighs during the early weigh part of the cycle; the valve 140 will be open, and consequently air from the pipe 220 will flow through that valve, but not through the valve 142 (which will be closed). The air which flows through the valve 140 will travel along the pipe 224 to the cylinder 173, causing operation of the cylinder 173 to reduce the speed of the elevator 16. At the same time, some air will travel along a pipe 225 to a shuttle valve 130

- 226, and from this valve *via* a pipe 227 to the cylinder 177, which releases its plunger 179 and allows the wheel 172 to be rotated by the cylinder 173.
- 5 Eventually, the valve 140 will close (cutting off the air supply to the cylinders 173 and 177, so that their rams will return under spring loading to the set position) and the valve 142 will open. This merely allows air 10 to pass *via* the pipe 228 to the valve 222. Operation of the valve 222 causes its air supply (from the pipe 221) to be connected with exhaust, and prevents that air supply passing *via* the pipe 229 to the valve 144.
- 15 Therefore, when the valve 144 (late weigh valve) is opened by its cam, nothing will happen, because there is no air supply to that valve.
- When the valve 146 is opened by its cam, 20 air flows through it, and through the pipe 230 to the pilot valve 202. The pilot valve is then opened to allow air to pass through the pipe 231 to the pan door cylinders 55 to open the doors and allow the pan to empty.
- 25 A branch pipe 232 from the pipe 230 allows air to flow to the baulking valve 222 to reset that valve.
- Finally, the valve 148 is opened, and air 30 flows through this valve and *via* a pipe 233 to the opposite side of the valve 202, which is then reset, so that air flows through it and through a pipe 234 to the lower ends of the cylinder 55 to close the pan doors. From the pipe 233, a branch pipe 334 leads to one 35 side of the control valve 201, so that air flowing through the valve 148 and the pipe 233 operates the valve 201, so that the mains air supply from the pipe 210 passes out through the valve 201 and a pipe 235 which is connected to the pushing-up board cylinders 63 and 64 and this causes the pushing up board to be projected. A further pipe 236 is also connected to the pipe 233, and air flows 40 through this pipe 236 into the control valve 45 203, to reset that valve. This has the effect of allowing mains air supplied to the valve 203 through the pipe 212 to flow *via* a pipe 237 to the lower end of the cushioning cylinder 59, and thus the cushioning ram is 50 retracted upwards.
- As soon as the scale pan empties, it begins to move upwardly turning on the pivots of the levers 45 and 46, and this releases the servo valve 56, which in turn closes the 55 valve 57, so that air is no longer supplied *via* the pipe 219 to the pilot side of the valve 203, and to the valves 140 and 142 *via* the pipe 220. Whilst the cushioning ram of the cylinder 59 is ascending, it is possible that 60 air may be supplied to both ends of the control valve 203 and for this purpose, this valve is a differential valve, which will return to its original position, if air pressure is applied at both ends. When the pushing up 65 board reaches its outer extremity, part of the

pushing up board strikes the plunger of the valve 216, and this allows mains air supplied through the pipe 215, to pass through the valve 216 and through a pipe 238 to the control valve 201, which is thereby reset so 70 that mains air passing through this valve then flows out through a pipe 239 to the outer ends of the cylinders 63 and 64, returning the pushing up board to its original position. This is the full cycle of operations 75 which is carried out if the mechanism is weighing early.

Supposing now that the mechanism is weighing correctly, when the valve 140 is 80 opened by the early weigh cam, no air will be supplied to that valve through the pipe 220, because at that time the scale pan will not have descended, and consequently the valve 57 will not have opened. However, at some time during the period when the correct weigh valve is open, air will be supplied through the pipe 220, because the scale pan will descend opening the valve 57, and air will then flow through the valve 142 to operate the baulking valve 222, but no action 90 will take place on the variable speed unit 30 because no air will be supplied to either of the cylinders 173 and 174. Thus the mechanism will continue to operate its elevator at the same speed as before. 95

Following on the operation of the valve 142, the same sequence of operations will be performed as previously described.

Supposing now that the mechanism is weighing late, then nothing will happen 100 when the valve 140 is opened and similarly nothing will happen when the valve 142 is opened, because no air will be supplied *via* the pipe 220, since the scale pan will not have dropped to open the valve 57. This 105 means that no air will be supplied to the pilot side of the baulking valve 222 which consequently will remain in its set position. As soon as the scale pan does fall, air will be supplied *via* the pipes 220 and 221 to the 110 valve 222, and will flow through the valve 222 and the pipe 229 to the valve 144. Since the valve 144 will at this stage have been opened by the late weigh cam, the air will flow through this valve, and thence through 115 a pipe 240 to a shuttle valve 241, and then *via* a pipe 242 to the cylinder 174. This will then operate to turn the wheel 172, so as to increase the output speed of the variable speed unit 30. Consequently, the drive to 120 the elevator 16 will be speeded up. From the pipe 242, a pipe 243 leads to the shuttle valve 226, and air flowing through this pipe 243 then flows from the shuttle valve 226, *via* the pipe 227 to operate the locking cylinder 177 to release the wheel 172 at the time when the cylinder 174 is operated. 125

After operation of the late weigh valve, the pan door valve 146 and pushing up board valve 148 will carry out their usual 130

operations, but the air supplied via the pipe 232 to the baulking valve 222 will have no effect because the baulking valve will not have been moved from its original set position.

- The pneumatic system just described therefore provides an arrangement for complete automatic control of the weigh-feed mechanism. However, for certain purposes it may be necessary to operate the control mechanism manually, and this is the reason for the provision of the manually operable valve 208. If this valve is opened, then air can flow from the manifold 207 through the valve 208 and a pipe 244 to the cylinder 174. Thus by continual operation of the manual valve 208, it is possible to adjust the output speed of the drive mechanism, to a maximum. For starting up purposes it is preferred to operate this manual valve until a maximum speed is achieved, and then let the automatic controls take over control of the weigh-feed mechanism to bring the speed to that which is required.

Further reference to Figure 8 shows that there may be two further cylinders which are shown dotted at 245 and 246, these cylinders being connected to operate simultaneously with the cushioning cylinder 59. The cylinders 245 and 246 are provided if it is thought desirable to put control flaps in the hopper frame above the scale pan, to cut off the supply of fibrous material falling from the hopper into the scale pan. In that case, these control flaps would be operated by the cylinders 245 and 246 in much the same way as the scale pan doors are operated by the cylinders 55.

The mechanism described in the above example is identical with that described in the specification of Application No. 9210/63 (Serial No. 1,044,542).

WHAT WE CLAIM IS:—

1. An arrangement for delivering weighed material to a processing machine, comprising a weigh feed mechanism comprising a conveyor adapted to supply the material to be weighed to a weigh-pan, the weigh-pan

being adapted to stop the conveyor when the pan receives a predetermined weight of material, and a control mechanism comprising three control devices adapted to be actuated successively by a timing mechanism driven in timed relationship with the processing machine, these control devices being arranged to cooperate in such a way with a fourth control device adapted to be actuated by the weigh-pan, as to regulate a variable speed drive to the conveyor, so that if the weigh-pan weighs early (i.e. before the appropriate period in the cycle of the timing mechanism to give a correct feed of material to the processing machine) the speed of the conveyor is reduced; if the weigh-pan weighs correctly there is no change of the speed of the conveyor, and if the weigh-pan weighs late, the speed of the conveyor is increased.

2. An arrangement as claimed in Claim 1, wherein a fifth control device is adapted to be operated if the weigh pan weighs early or correctly, to prevent any alteration in the speed of the conveyor due to subsequent actuation of the control device associated with late weighing.

3. An arrangement as claimed in Claim 1 or Claim 2, in which the control devices are valves for a pneumatic or hydraulic system.

4. An arrangement as claimed in Claim 3, in which the valves forming the first three control devices are adapted to be operated by cams driven in timed relationship with the processing machine.

5. An arrangement as claimed in any one of Claims 1 to 4, in which the variable speed device comprises a unit in which pneumatic or hydraulic cylinders are operated to control the variable speed drive.

6. An arrangement as claimed in Claim 5, in which the variable speed unit is of the kind which is adapted to provide an infinite number of ratios over a specific range of operation.

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1,044,541 COMPLETE SPECIFICATION
6 SHEETS
*This drawing is a reproduction of
the Original on a reduced scale.*
SHEET 1

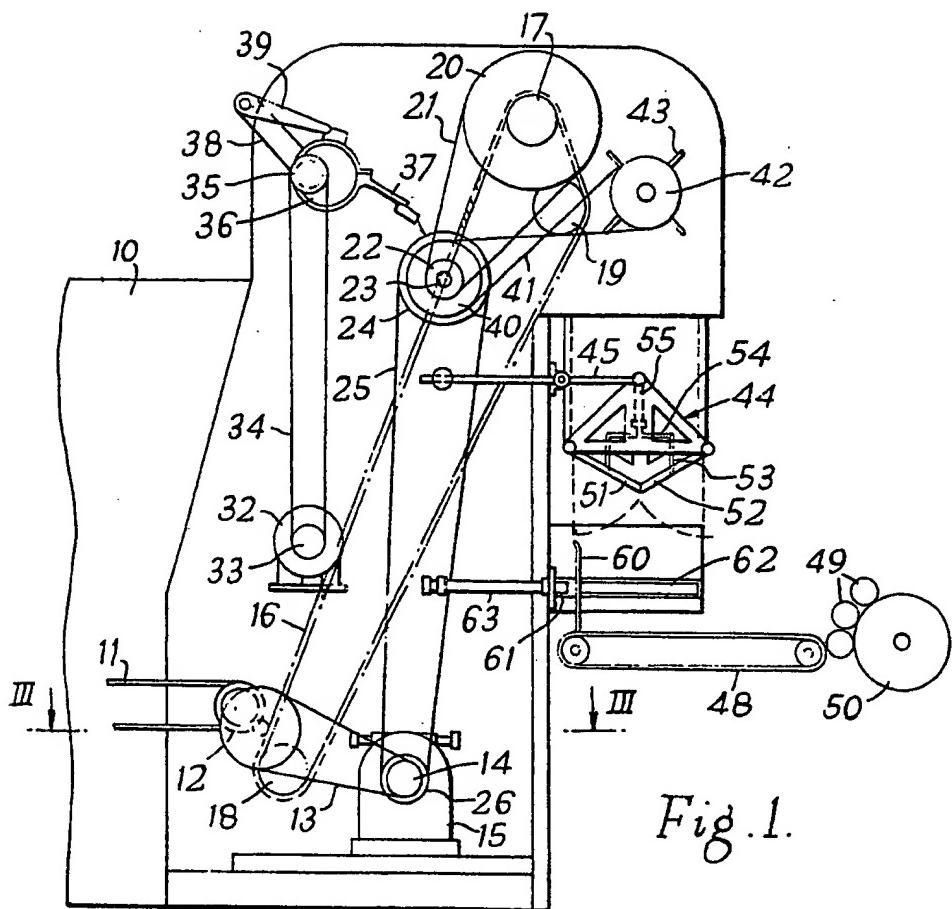
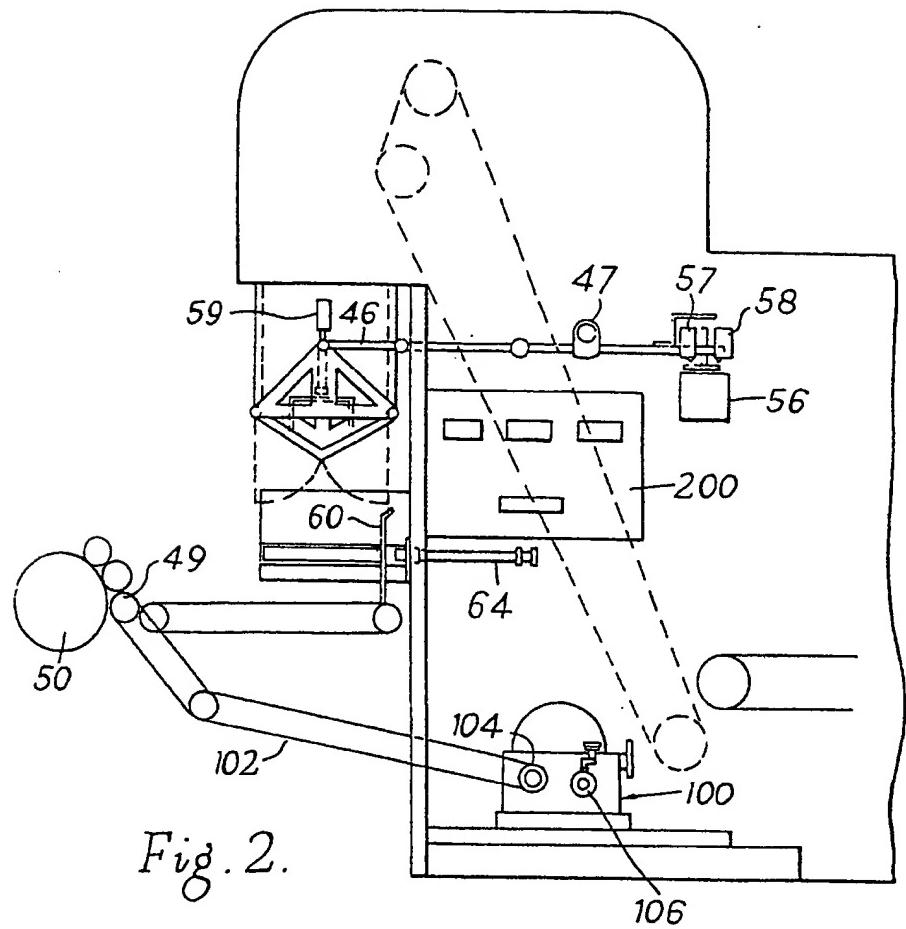


Fig. 1.



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6 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of
the Original on a reduced scale.
SHEETS 2 & 3

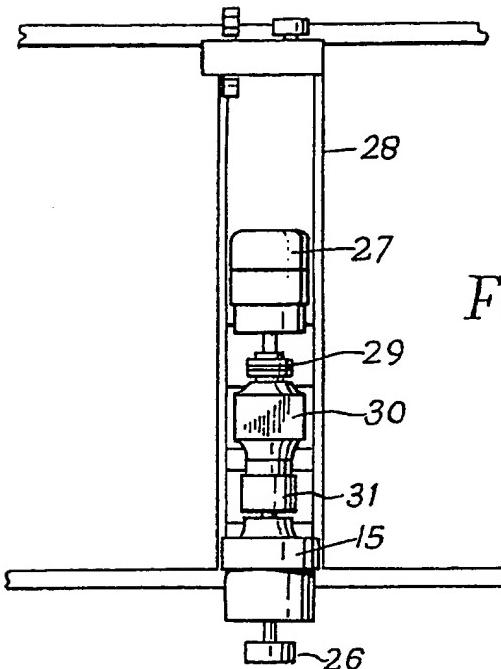


Fig. 3.

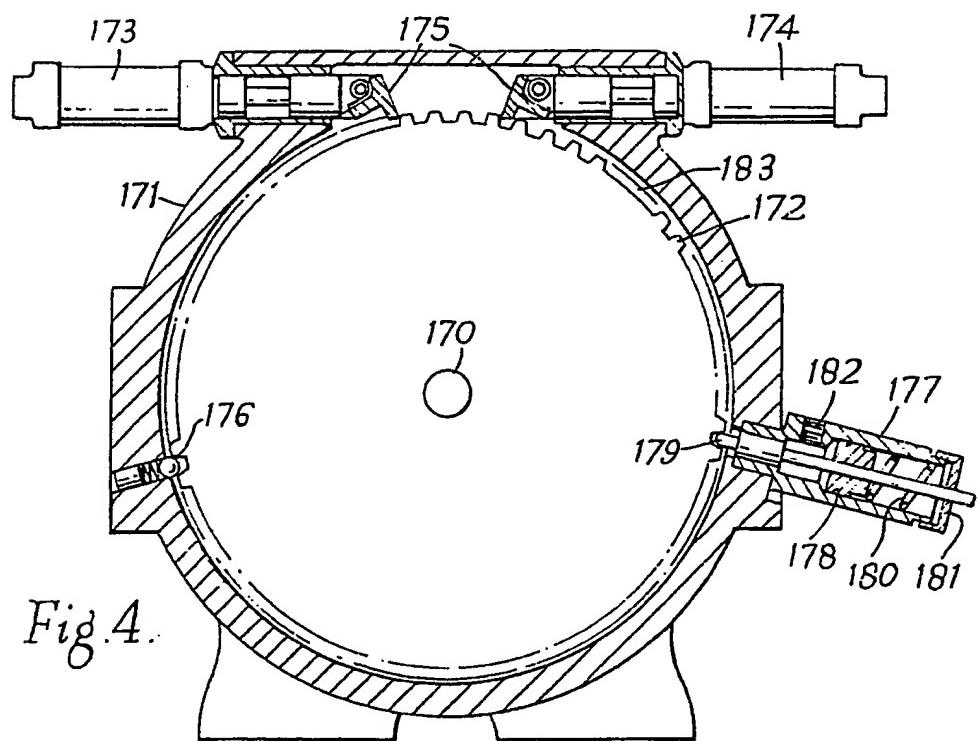


Fig. 4.

1,044,541 COMPLETE SPECIFICATION
6 SHEETS This drawing is a reproduction of
the Original on a reduced scale.
SHEETS 2 & 3

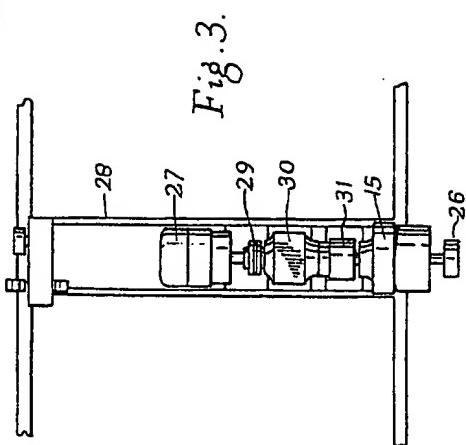


Fig. 3.

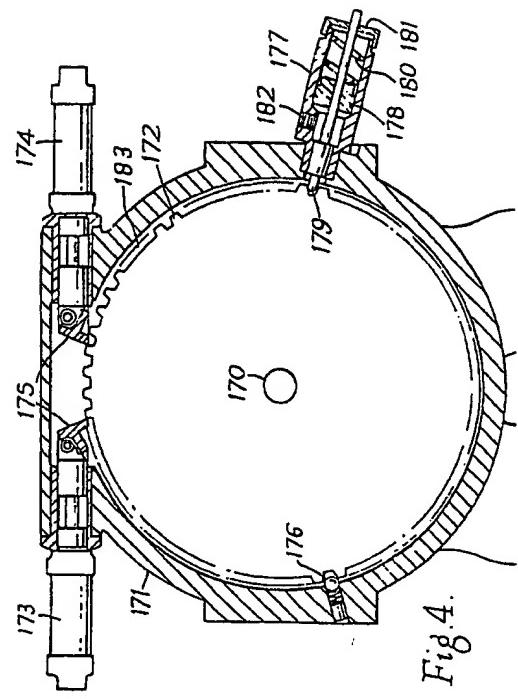


Fig. 4.

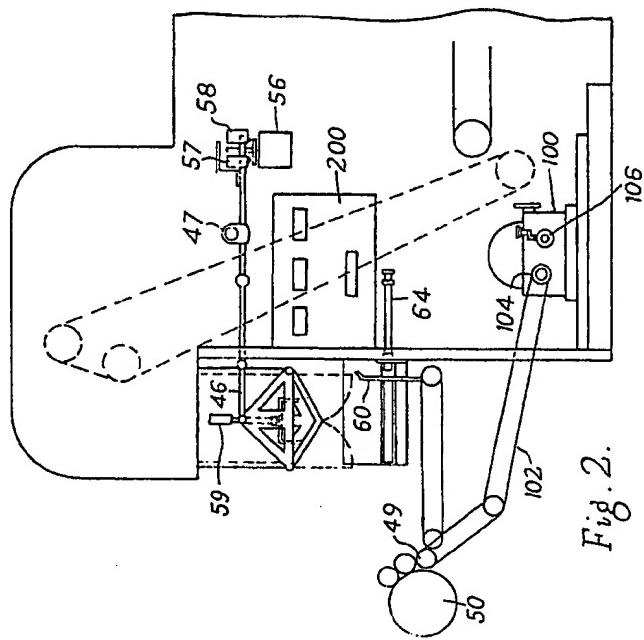


Fig. 2.

Fig. 5.

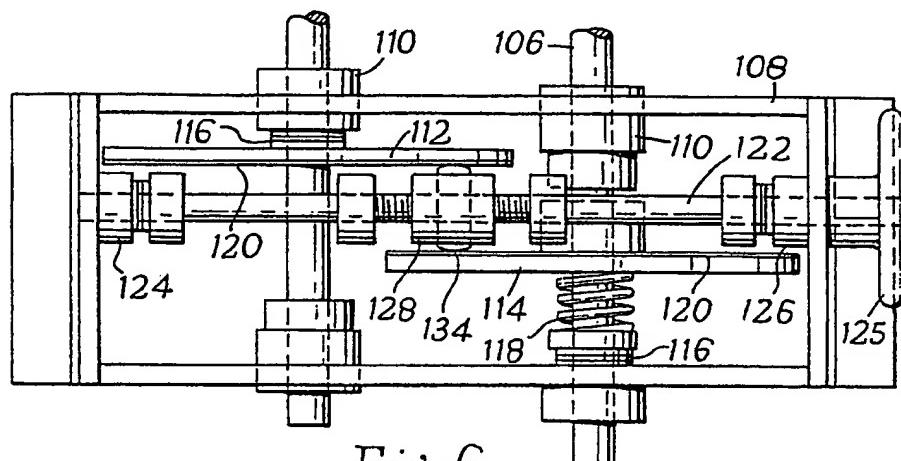
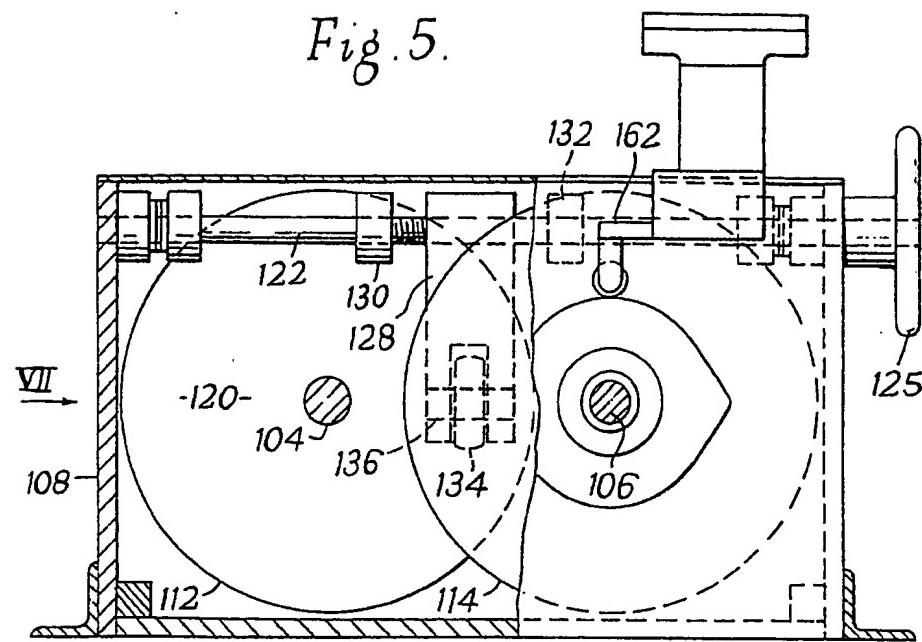


Fig. 6.

1,044,541 COMPLETE SPECIFICATION

6 SHEETS

*This drawing is a reproduction of
the Original on a reduced scale.
SHEETS 4 & 5*

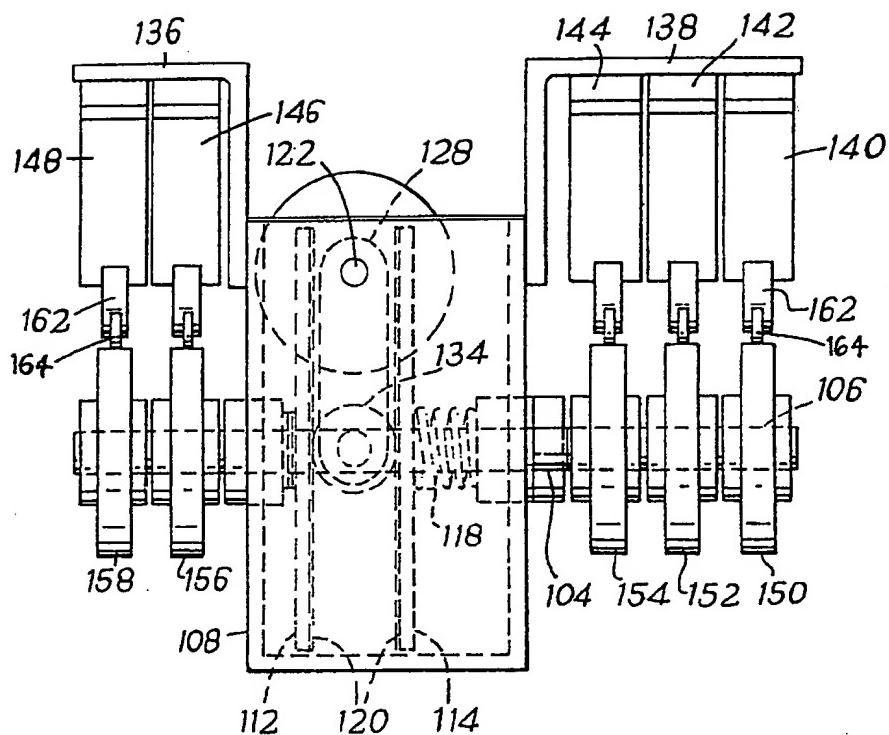
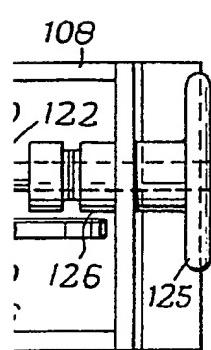
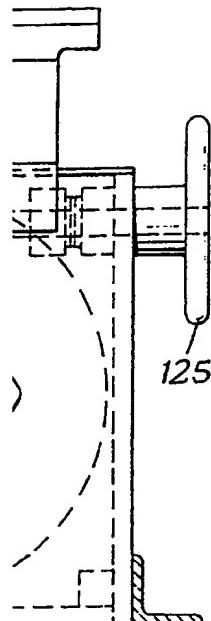


Fig. 7.

1,044,541 COMPLETE SPECIFICATION
6 SHEETS This drawing is a reproduction of
the Original on a reduced scale.
SHEETS 4 & 5

Fig. 5.

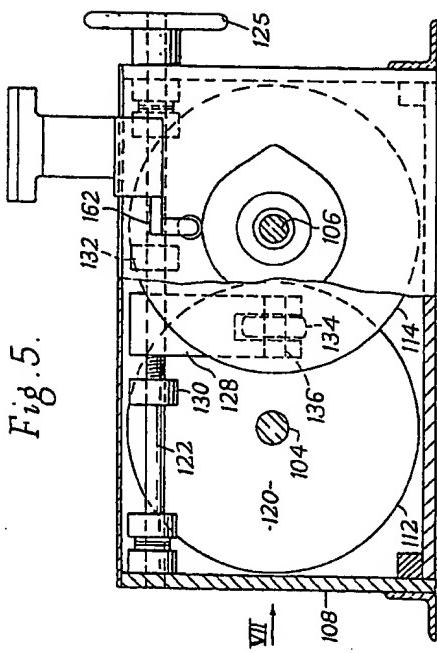


Fig. 6.

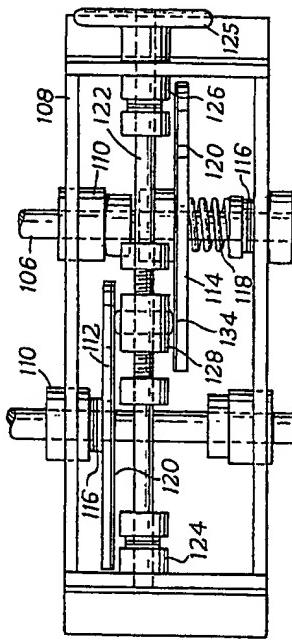
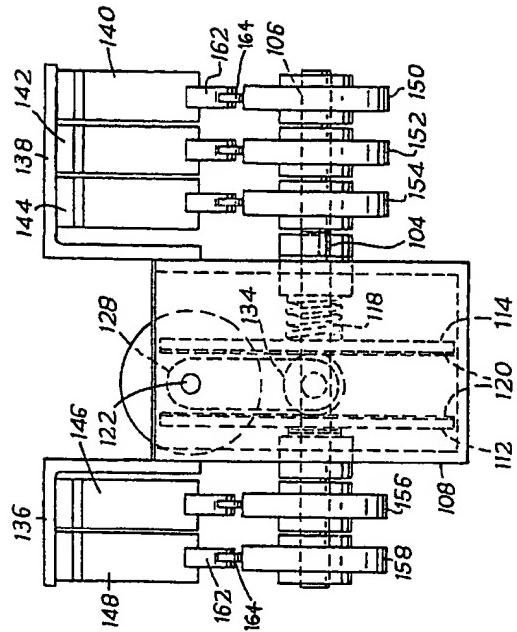
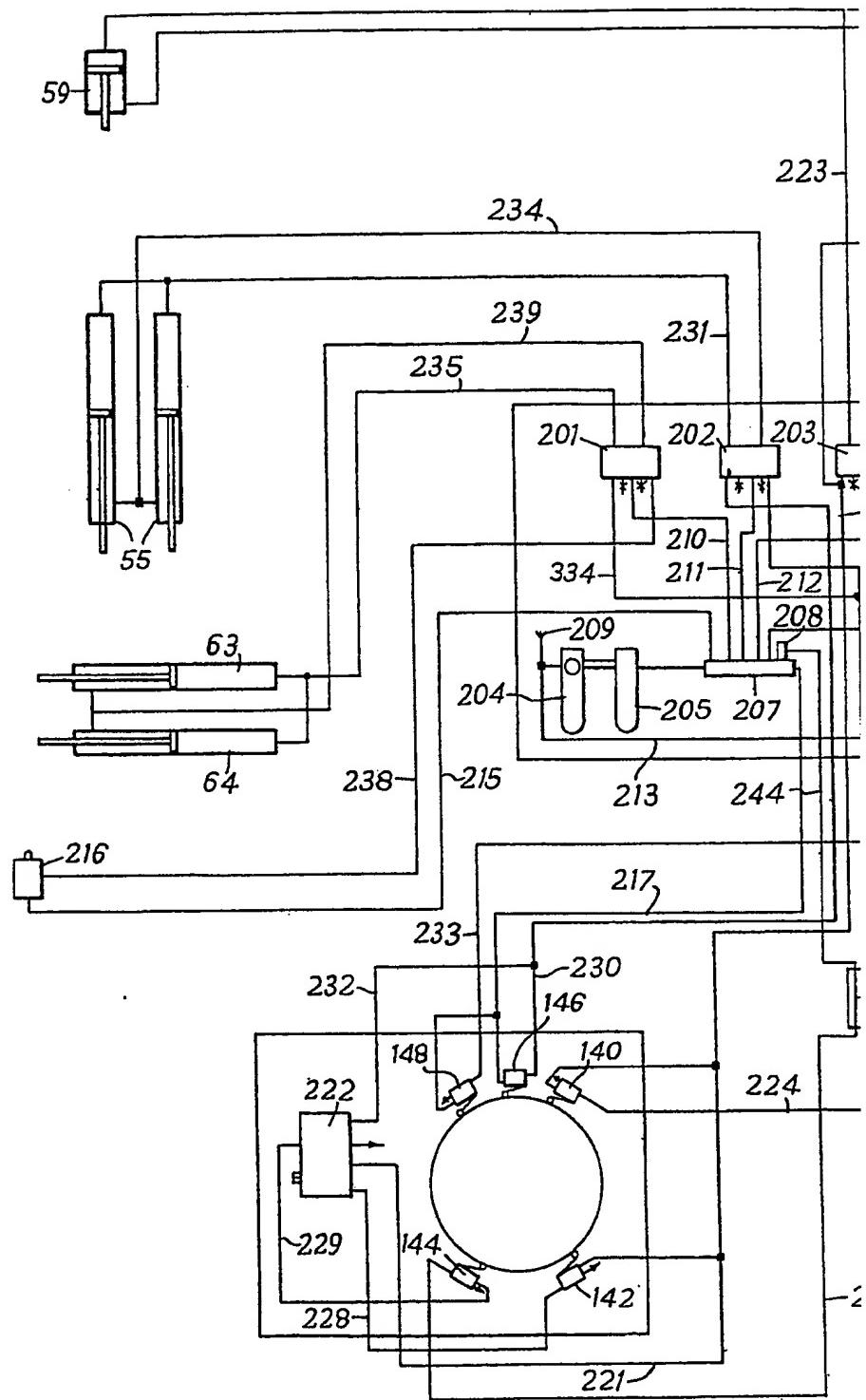


Fig. 7.





1,044,541
6 SHEETS

COMPLETE SPECIFICATION
*This drawing is a reproduction of
the Original on a reduced scale.*
SHEET 6

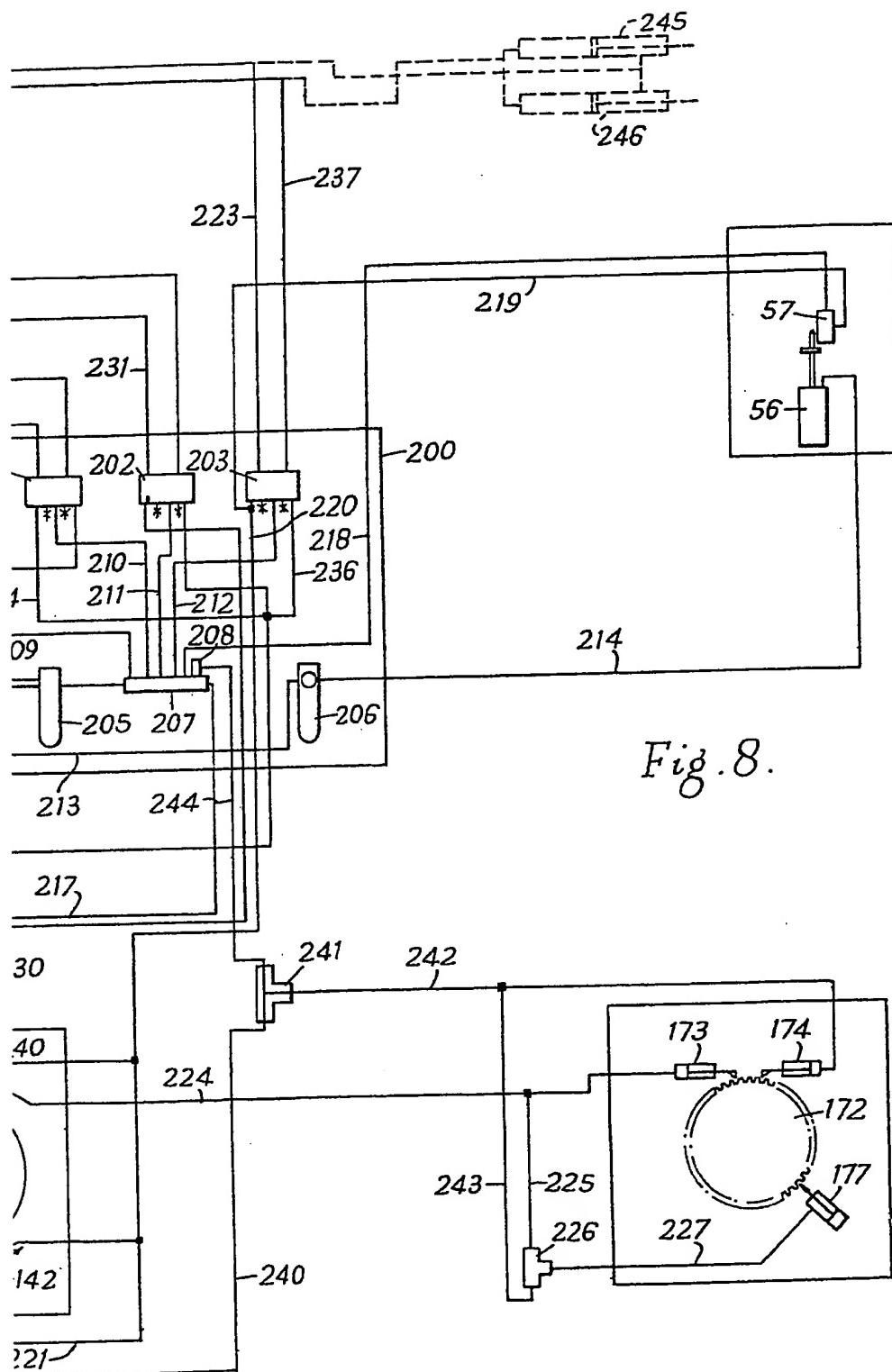


Fig. 8.

